


REDCap and DDI

Exporting Data and Metadata with the API

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REDCap Consortium

<http://project-redcap.org/>



[Consortium Wiki](#) (Login Required)

Upcoming Events:

- Weekly All-Hands Consortium Meeting - Every Friday, 1-2PM Central


[Introduction](#) [Software](#) [Consortium Partners](#) [Become a Partner](#) [Video Resources](#) [Citing REDCap](#) [Library](#)

The REDCap Consortium is composed of **509 active institutional partners** from CTSA, GCRC, RCM and other institutions in **48 countries**. The consortium supports a secure web application (REDCap) designed exclusively to support data capture for research studies.

The REDCap application allows users to build and manage online surveys and databases quickly and securely, and is currently in production use or development build-status for more than **51,600 projects** with over **68,900 users** spanning numerous research focus areas across the consortium. To find out if your institution is already running REDCap, you will find contact information on the [Consortium Partners](#) page. Learn more about REDCap by watching a [brief summary video \(4 min\)](#).

Map of REDCap Consortium Partners

[View fullscreen map](#)



Recent research studies citing REDCap:

Procurement of Shared Data Instruments for Research Electronic Data Capture (REDCap) *J Biomed Inform.* 2012 Nov 10. pii: S1532-0464(12)00160-8. doi: 10.1016/j.jbi.2012.10.006. [Epub ahead of print].

Unplanned cigarette purchases and tobacco point of sale advertising: a potential barrier to smoking cessation *Tob Control.* 2012 Nov 8. [Epub ahead of print].

Prevalence, Incidence, and Classification of Chronic Fatigue Syndrome in Olmsted County, Minnesota, as Estimated Using the Rochester Epidemiology Project *Mayo Clin Proc.* 2012 Nov 7. pii: S0025-6196(12)00923-8. doi: 10.1016/j.mayocp.2012.08.015. [Epub ahead of print].

Survey of Hand Surgeons Regarding Their Perceived Needs for an Expanded Upper Extremity Fellowship *J Hand Surg Am.* 2012 Nov;37(11):2374-2380.e3. doi: 10.1016/j.jhsa.2012.08.013.

Weekly Calendar Planning Activity (WCPA): A Performance-Based Assessment of Executive Function Piloted With At-Risk Adolescents *Am J Occup Ther.* 2012 Nov;66(6):699-708. doi: 10.5014/ajot.2012.004754.

Comprehensive Knowledge of HIV among Women in Rural Mozambique: Development and Validation of the HIV Knowledge 27 Scale *PLoS One.* 2012;7(10):e48676. doi: 10.1371/journal.pone.0048676. Epub 2012 Oct 31.

[View all 160 articles](#)

REDCap Citation



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Citing REDCap

Please cite the publication below in study manuscripts using REDCap for data collection and management. We recommend the following boilerplate language:

Study data were collected and managed using REDCap electronic data capture tools hosted at [YOUR INSTITUTION].¹ REDCap (Research Electronic Data Capture) is a secure, web-based application designed to support data capture for research studies, providing: 1) an intuitive interface for validated data entry; 2) audit trails for tracking data manipulation and export procedures; 3) automated export procedures for seamless data downloads to common statistical packages; and 4) procedures for importing data from external sources.

¹Paul A. Harris, Robert Taylor, Robert Thielke, Jonathon Payne, Nathaniel Gonzalez, Jose G. Conde, Research electronic data capture (REDCap) - A metadata-driven methodology and workflow process for providing translational research informatics support, J Biomed Inform. 2009 Apr;42(2):377-81.

Link to article: <http://www.sciencedirect.com/science/article/pii/S1532046408001226>

REDCap as an Environment

- Secure
- Web based
- Build and manage online surveys and databases
 - Online Designer
 - Excel template file
- Exports to SPSS, SAS, Stata, and R
- Project management features
 - Calendar, scheduling, email notices, reporting, triggers, longitudinal studies, rights and permissions

R Function

```
REDCapAPI_ToDDI <- function(secret_token = "", # the token for the user&project
                             DDInstanceFile="", # the output DDI file
                             EchoDDI=FALSE, # if TRUE, print the generated DDI to the console
                             IncludeData=TRUE, # if TRUE, include PhysicalRecordSegment and output
                             StudyTitle="Study Title goes here", # the title of the study
                             agency="example.org", # the agency responsible for the data
                             organizationSchemeNameText="Org scheme", # the name for the
                                                                           # Organization Scheme
                             organizationNameText="Organization name", # the organization name
                             CurrentVersion="1.0.0", # the default current version number
                             EmbargoEndDateValue="2112-01-01T01:01:01" # a dateTime at which
the embargo on Personally Identifiable data will expire
)
```

Test – DDI to Colectica Express

Question Name

race

Question Text

Race

Response Options

Add Response Type

Coded Classification

Response Label

Response Description

REDCap Field Type: dropdown

Selection Style

Select one

Search for an item

CodeScheme7

Variable

Race Agency example.org Revision 1 Last Updated 2013-0

Representation

Details

Conceptual

Sources

External Ma

Name

race

Label

Race

Description

This variable was collected from a REDCap dropdown question.

Representation Type

Code

Coded Classification

Search for an item

CodeScheme7

☒ Blank values represent missing values.

0

American Indian/Alaska Native

1

Asian

2

Native Hawaiian or Other Pacific Islander

3

Black or African American

4

White

5

More Than One Race

6

Unknown / Not Reported

Instruments

Instrument for form prescreening_survey

Instrument for form participant_info_survey

Instrument for form participant_morale_questionnaire

Instrument for form completion_data

Test – Data into SAS

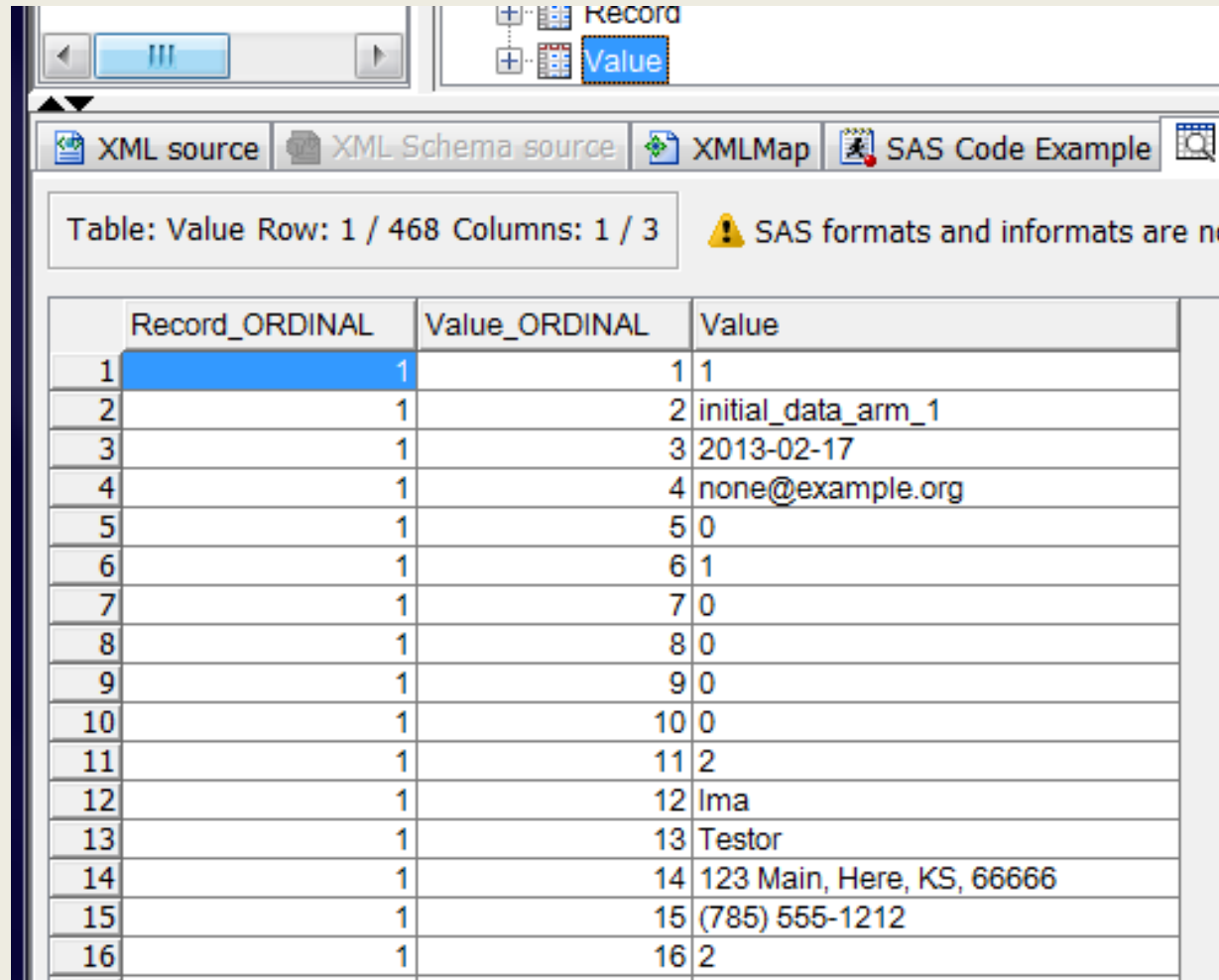
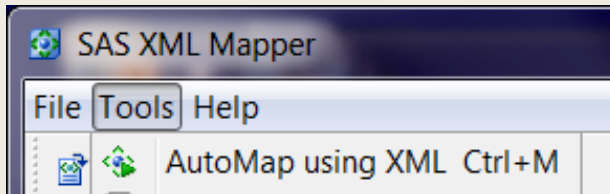




Table: Value Row: 1 / 468 Columns: 1 / 3  SAS formats and informats are not supported

	Record_ORDINAL	Value_ORDINAL	Value
1	1	1	1
2	1	2	initial_data_arm_1
3	1	3	2013-02-17
4	1	4	none@example.org
5	1	5	0
6	1	6	1
7	1	7	0
8	1	8	0
9	1	9	0
10	1	10	0
11	1	11	2
12	1	12	Ima
13	1	13	Testor
14	1	14	123 Main, Here, KS, 66666
15	1	15	(785) 555-1212
16	1	16	2

Start Screen

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Welcome to REDCap!

REDCap is a secure, web-based application for building and managing online surveys and databases. Using REDCap's stream-lined process for rapidly developing projects, you may create and design projects using 1) the online method from your web browser using the Online Designer; and/or 2) the offline method by constructing a 'data dictionary' template file in Microsoft Excel, which can be later uploaded into REDCap. Both surveys and databases (or a mixture of the two) can be built using these methods.

REDCap provides automated export procedures for seamless data downloads to Excel and common statistical packages (SPSS, SAS, Stata, R), as well as a built-in project calendar, a scheduling module, ad hoc reporting tools, and advanced features, such as branching logic, file uploading, and calculated fields.

Learn more about REDCap by watching a [brief summary video \(4 min\)](#). If you would like to view other quick video tutorials of REDCap in action and an overview of its features, please see the [Training Resources](#) page.

NOTICE: If you are collecting data for the purposes of human subjects research, review and approval of the project is required by your Institutional Review Board.

If you require assistance or have any questions about REDCap, please contact [Todd Little, PhD](#).

REDCap Features

Build online surveys and databases quickly and securely - Create and design your project rapidly using secure web authentication from your browser. No extra software is required.

Fast and flexible - Conception to production-level survey/database in less than one day.

Export data to common data analysis packages - Export your data to Microsoft Excel, PDF, SAS, Stata, R, or SPSS for analysis.

Ad Hoc Reporting - Create custom queries for generating reports to view or download.

Scheduling - Utilize a built-in project calendar and scheduling module for organizing your events and appointments.


Easily manage a contact list of survey respondents or create a simple survey link - Build a list of email contacts, create custom email invitations, and track who responds, or you may also create a single survey link to email out or post on a website.


Send files to others securely - Using 'Send-It', upload and send files to multiple recipients, including existing project documents, that are too large for email attachments or that contain sensitive data


Online Designer – Project Setup


The University of Kansas
Center for Research Methods and Data Analysis


My Example Survey For DDI


 Project Home


 Project Setup

 Other Functionality

 Project Revision History

Project status:  Development

 [VIDEO: How to create and manage a survey in REDCap](#)
Completed steps **0** of **7**




Not started

I'm done!

Modify project settings or make customizations

You have created your project and are ready to begin building on it. If you would like to modify the general project settings that you set when creating the project or if you wish to make some customizations to the project (e.g. enable auto-numbering for new records), use the buttons below.

Go to Modify project settings or Make customizations




In progress

I'm done!

Set up my survey


Set up your survey by providing basic information about the survey (e.g. survey title, instructions, settings). Once the survey is set up, you may return any time to modify the survey settings.

Go to Modify survey settings or Preview survey or Download survey as PDF

 **Survey is currently active**

Take survey offline

The survey title is **My Example Survey**



In progress

I'm done!

Design your survey questions

Add or edit questions for your survey. This may be done by either using the Online Designer (online method) or by uploading a Data Dictionary (offline method), in which you may use either method or both. Quick links: [Download PDF of all data collection instruments](#) OR [Download the current Data Dictionary](#)

Go to Online Designer or Upload Data Dictionary

Have you checked the [Check For Identifiers](#) page to ensure all identifier fields have been tagged?

Project Setup (continued)



Optional

I'm done!

Set up project bookmarks (optional)

You may create custom bookmarks to webpages that exist inside or outside of REDCap. These bookmarks will be seen as links on the left-hand project menu and can be accessed at any time by users who are given privileges to do so. Every project bookmark has custom settings that allow one to control its appearance and behavior.

Go to [Add or edit bookmarks](#)



Not started

I'm done!

Triggers & Notifications (optional)

Set up triggers and notifications for your survey. Currently, you may set your survey to notify you via email when any participant completes it. In the future, other kinds of triggers and notifications will become available for use.

Go to [Triggers & Notifications](#)



Optional

I'm done!

User Rights and Permissions

You may grant other users access to this project or edit the user privileges of current users on this project by navigating to the User Rights page.

Go to [User Rights](#)



Not started

Move your project to production status



Move the project to production status so that real data may be collected. Once in production, you will not be able to edit the project fields in real time anymore. However, you can make edits in Draft Mode, which will then need to be approved by a REDCap administrator before taking effect.

Go to [Move project to production](#)

Online Designer – Question Sequence

Add Question






Add Matrix of Questions

Section 1 (This is a section header with descriptive text. It only provides informational text and is used to divide the survey into sections for organization. If the survey is set to be displayed as "one section per page", then these section headers will begin each new page of the survey.)

Add Question

Add Matrix of Questions






     Variable: textbox

This is a TEXT BOX, which allows respondents to enter a small amount of text. A Text Box can be validated, if needed, as a number, integer, phone number, email, or zipcode. If validated as a number or integer, you may also set the minimum and/or maximum allowable values.

This question has "number" validation set with a minimum of 1 and a maximum of 10.
It is tagged as Question Number 3

Add Question

Add Matrix of Questions

     Variable: radio2_edf

You may create MULTIPLE CHOICE questions and set the answer choices for them. You can have as many answer choices as you need. This multiple choice question is rendered as RADIO buttons.

☐ Choice One

☐ Choice Two






☐ Choice Three

☐ Choice Four

reset

Add Question

Add Matrix of Questions

     Variable: radio2_edf2_1f8

You may create MULTIPLE CHOICE questions and set the answer choices for them. You can have as many answer choices as you need. This multiple choice question is rendered as RADIO buttons.

☐ Choice One

☐ Choice Two

☐ Choice Three

☐ Choice Four

reset

DDI





<Instrument>

<Sequence>

<ControlConstruct>

<Universe>





NADDI Pre-Conference Survey





Variable: hearabout

How did you hear about this conference?

Expand




Add Field
Add Matrix of Fields





Variable: pre_suggestions



Do you have any suggestions for future pre-conference procedures (registration, conference information, etc)?

Expand



Add Field
Add Matrix of Fields




Matrix group: prerating

For this next section please rate how interested you are in each of the presentations based on the descriptions on the conference web page <http://www.ipsr.ku.edu/naddi/abstracts.shtml>



Variable: rogatus

	Very Disinterested	Somewhat Disinterested	Neutral	Somewhat Interested	Very Interested	
Rogatus - a planned open source toolset to cover the whole lifecycle	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	reset



Variable: ocul

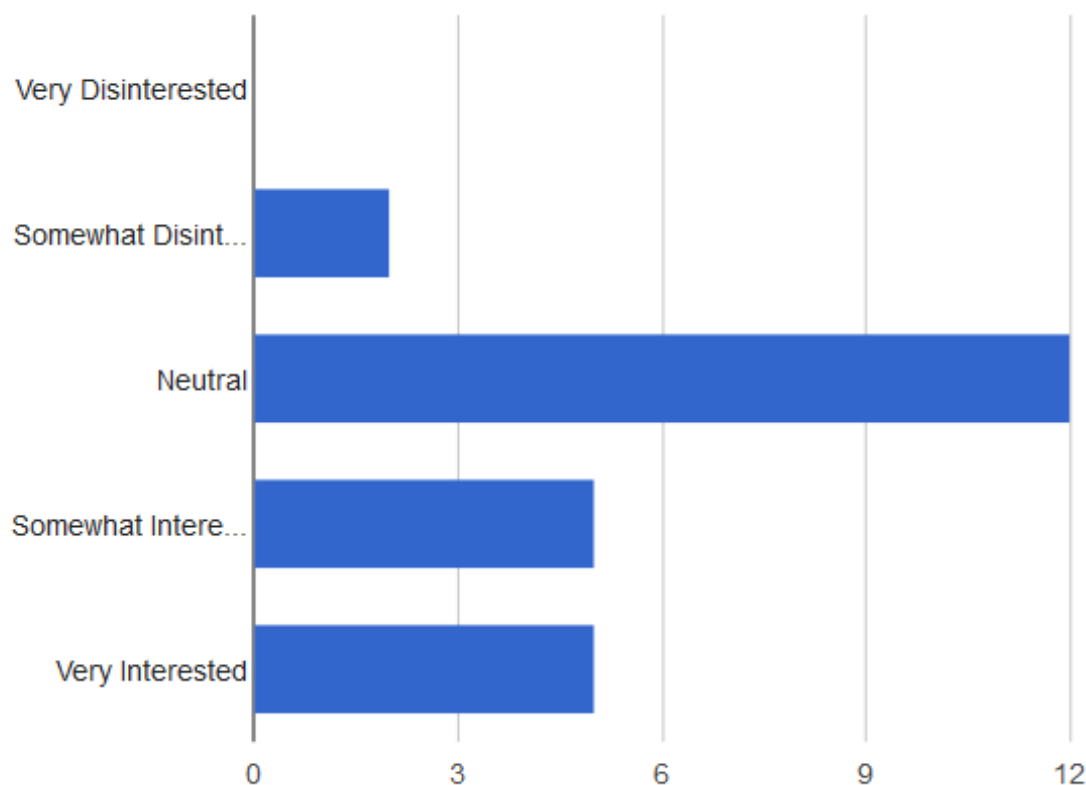
Collaborative markup of library & researcher data: Examples from OCUL	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	reset
---	-----------------------	-----------------------	-----------------------	-----------------------	-----------------------	-------

Interest in This Presentation

REDCap and DDI an update: [Refresh Plot](#) | View as Bar Chart ▼

Total (N)	Missing	Unique
24	0 (0%)	4


Counts/frequency: Very Disinterested (0, 0%), Somewhat Disinterested (2, 8.3%), Neutral (12, 50%), Somewhat Interested (5, 20.8%), Very Interested (5, 20.8%)



Individual Question

Edit Field



You may add a new project field to this data collection instrument by completing the fields below and clicking the Save button at the bottom. When you add a new field, it will be added to the form on this page. For an overview of the different field types available, you may view the  [Field Types video \(5 min\)](#).

Field Type:

Question Number (optional)

Displayed only on the survey page

Field Label

You may create MULTIPLE CHOICE questions and set the answer choices for them. You can have as many answer choices as you need. This multiple choice question is rendered as RADIO buttons.

Choices (one choice per line)

- 1, Choice One
- 2, Choice Two
- 3, Choice Three
- 4, Choice Four

[How do I manually code the choices?](#)

Variable Name (utilized during data export)

ONLY letters, numbers, and underscores

☐

Enable auto naming of variable based upon its Field Label?

Required?* ☒ No ☐ Yes

* Prompt if field is blank

Identifier? ☒ No ☐ Yes


Does the field contain identifying information (e.g. name, SSN, address)?

Custom Alignment

Align the position of the field on the page

Field Note (optional)

Small reminder text displayed underneath field

Looking for Branching Logic? Try clicking the  icon for this field after clicking the Save or Cancel button below.

Save

Cancel

DDI

Categories

Codes

Questions

Variables

Name

Label

Representation

StatementItem

Field Types

Multiple Choice - Radio Buttons (Single Answer)



Representation

And

Layout

Can imply
multiple
automatic
variables

--- Select a Type of Field ---

Text Box (Short Text)

Notes Box (Paragraph Text)

Calculated Field

Multiple Choice - Drop-down List (Single Answer)

Multiple Choice - Radio Buttons (Single Answer)

Checkboxes (Multiple Answers)

Yes - No

True - False

Slider / Visual Analog Scale

File Upload (for users to upload files)






Descriptive Text (with optional Image/File Attachment)

Begin New Section (with optional text)

Field Type

Branching

Conditional execution of one question and its header and footer

     Variable: hidden_branch [Branching logic exists]

HIDDEN QUESTION: This question will only appear when you select the second option of the question immediately above.

A Field Note for a hidden question

[Add Question](#) [Add Matrix of Questions](#)

Choose method below for the following field: **hidden_branch** - *HIDDEN QUESTION: This question will only appe...*



Advanced Branching Logic Syntax

[\(How do I use the advanced syntax?\)](#)

Show the field ONLY if...

[radio_branch] = "2"

[Clear logic](#)



Drag-N-Drop Logic Builder

Field choices from other fields

(drag a choice below to box on right)

participant_id = (define criteria)

textbox = (define criteria)

radio2_edf = Choice One (1)

radio2_edf = Choice Two (2)

radio2_edf = Choice Three (3)

radio2_edf = Choice Four (4)

radio2_edf2_1f8 = Choice One (1)

radio2_edf2_1f8 = Choice Two (2)

radio2_edf2_1f8 = Choice Three (3)




Drag
and
Drop



Show the field ONLY if...

☒ ALL below are true

☐ ANY below are true

radio_branch = Clicking this option will trigger the branching logic... (2) 

[Clear logic](#)

Events

◀ Project Setup

🕒 Define My Events













📅 Designate Instruments for My Events

Arm 1

+Add New Arm

Arm name: **Arm 1**

[Rename Arm 1](#)

	Event #	Days Offset	Offset Range Min / Max	Event Name	Unique event name (auto-generated) ?
 	1	0	-0/+0	Initial Data	initial_data_arm_1
 	2	1	-0/+0	Week 1	week_1_arm_1
 	3	8	-0/+0	Week 2	week_2_arm_1
 	4	15	-0/+0	Week 3	week_3_arm_1
 	5	22	-0/+0	Week 4	week_4_arm_1
 	6	30	-0/+0	Final Data	final_data_arm_1
<input type="button" value="Add new event"/>		<input type="text"/> Days Convert from other units	<input type="text" value="-0"/> <input type="text" value="+0"/>	<input type="text"/> Descriptive name for this event	

Event to Instrument Mappings

◀ Project Setup

⌚ Define My Events

📄 Designate Instruments for My Events

Since you have defined multiple events on the [Define My Events](#) page, you may now select which data collection you wish to utilize for each event by using the table below. This allows you to enter data on any data collection for any given project record. Any and all data collection instruments can thus be used for any event defined.

Click the **Begin Editing** button to change the relationships below by designating which forms you wish to utilize. When you are finished making changes, click the **Save** button to finalize your changes.

Begin Editing

Save






Data Collection Instrument	Events					
	Initial Data (1)	Week 1 (2)	Week 2 (3)	Week 3 (4)	Week 4 (5)	Final Data (6)
Pre-Screening Survey (survey)	✓					
Participant Info Survey (survey)	✓					
Participant Morale Questionnaire (survey)		✓	✓	✓	✓	
Completion Data (to be entered by study personnel only)						✓

Data entry management - subject

Event Grid








The grid below displays the form-by-form progress of data entered into the project for one particular Participant ID for all defined events. You may click on the colored buttons to access that form for that event. If you wish, you may modify the events below by navigating to the [Define My Events](#) page.

Legend for status icons:

-  Incomplete
-  Unverified
-  Complete
-  Partial Survey Response
-  Completed Survey Response

✓ Participant ID 2 successfully edited

Participant ID 2






Data Collection Instrument	Events					
	Initial Data (1)	Week 1 (2)	Week 2 (3)	Week 3 (4)	Week 4 (5)	Final Data (6)
Pre-Screening Survey (survey)						
Participant Info Survey (survey)						
Participant Morale Questionnaire (survey)						
Completion Data (to be entered by study personnel only)						

All records















Record Status Dashboard (all records)

Displayed below is a table listing all existing records/responses and their status for every data collection instrument (and if longitudinal, for every event). You may click any of the colored buttons in the table to open a new tab/window in your browser to view that record on that particular data collection instrument. Please note that if your form-level user privileges are restricted for certain data collection instruments, you will only be able to view those instruments, and if you belong to a Data Access Group, you will only be able to view records that belong to your group.

Legend for status icons:

-  Incomplete
-  Unverified
-  Complete
-  Partial Survey Response
-  Completed Survey Response

Displaying record "1" through "2" of 2 records

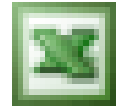
Participant ID	Pre-Screening Survey Initial Data	Participant Info Survey Initial Data	Participant Morale Questionnaire Week 1	Participant Morale Questionnaire Week 2	Participant Morale Questionnaire Week 3	Participant Morale Questionnaire Week 4	Completion Data (to be entered by study personnel only) Final Data
1							
2							

Exporting from REDCap

- Interactive
 - Forms metadata
 - Data
- API
 - Forms metadata
 - Data
 - Users (this is researchers, not respondents)
 - Events
 - Form-Event Mappings

Exporting Metadata (Codebook) - GUI

1.) Download the current Data Dictionary



Note the multiple forms

A	B	C	D
Variable /	Form Name	Section Header	Field Type
participant	prescreening_survey		text
dob	prescreening_survey	Please fill out th	text
email	prescreening_survey		text
has_diabe	prescreening_survey		truefalse
consent	prescreening_survey		checkbox
first_name	participant_info_survey	As a participant	text
last_name	participant_info_survey		text
address	participant_info_survey		notes
telephone	participant_info_survey		text
ethnicity	participant_info_survey		radio
race	participant_info_survey		dropdown
sex	participant_info_survey		radio
height	participant_info_survey		text
weight	participant_info_survey		text
pmq1	participant_morale_questionnaire	As a participant	dropdown

REDCap API – export form-event mappings

[Project Setup](#) [Define My Events](#) [Designate Instruments for My Events](#)

Since you have defined multiple events on the [Define My Events](#) page, you may now select which data collection instruments you wish to utilize for each event by using the table below. This allows you to enter data on any data collection instrument for any given project record. Any and all data collection instruments can thus be used for any event defined.

Click the [Begin Editing](#) button to change the relationships below by designating which forms you wish to utilize. When you are finished making changes, click the [Save](#) button to finalize your changes.

[Begin Editing](#) [Save](#)

Data Collection Instrument	Events					
	Initial Data (1)	Week 1 (2)	Week 2 (3)	Week 3 (4)	Week 4 (5)	Final Data (6)
Pre-Screening Survey (survey)	✓					
Participant Info Survey (survey)	✓					
Participant Morale Questionnaire (survey)		✓	✓	✓	✓	
Completion Data (to be entered by study personnel only)						✓

```
arm_num  unique_event_name      form_name
1         1 initial_data_arm_1  prescreening_survey
2         1 initial_data_arm_1  participant_info_survey
3         1      week_1_arm_1  participant_morale_questionnaire
4         1      week_2_arm_1  participant_morale_questionnaire
5         1      week_3_arm_1  participant_morale_questionnaire
6         1      week_4_arm_1  participant_morale_questionnaire
7         1  final_data_arm_1    completion_data
>
```

HTML form to Test API

REDCapAPI tester

Token for project NADDI

Token is specific to project and authorized person

content parameter

formEventMapping
record
metadata
user
event

`<input type="text" name="token" id="token" />`

format parameter

csv
json
xml

type is applicable to content of "record"

type parameter

flat (output as one record per row)
eav (output one data point per row)

```
<form action="https://r<host>/api/"
method="POST"
name="form1"
target="_blank"
id="form1">
```

Send API request

Data - Records_flat as csv

A	B	C	D	E	F
participant_id	redcap_event_name	dob	email	has_diabetes	consent__1
1	initial_data_arm_1	2/17/2013	none@example.org	0	1
2	initial_data_arm_1	2/27/2013	parti2@example.org	0	1
2	week_1_arm_1				
2	week_2_arm_1				
2	week_3_arm_1				
2	week_4_arm_1				
2	final_data_arm_1				
3	initial_data_arm_1	3/18/2013	foo@bar.com	1	0

Records – Flat (all forms in one table)

– <records>

– <item>

```
<participant_id>1</participant_id>
<redcap_event_name>initial_data_arm_1</redcap_event_name>
<dob>2013-02-17</dob>
<email>none@example.org</email>
<has_diabetes>0</has_diabetes>
<consent_1>1</consent_1>
```

prescreening
_survey

```
<prescreening_survey_complete>2</prescreening_survey_complete>
<first_name>Ima</first_name>
<last_name>Testor</last_name>
<address>123 Main, Here, KS, 66666</address>
<telephone_1>(785) 555-1212</telephone_1>
<ethnicity>2</ethnicity>
<race>6</race>
<sex>0</sex>
<height>130</height>
<weight>35</weight>
```

participant_info_
survey

```
<participant_info_survey_complete>2</participant_info_survey_complete>
<pmq1/>
<pmq2/>
<choices/>
<life/>
<job/>
<family/>
<participant_morale_questionnaire_complete/>
<complete_study/>
```

participant_morale_
questionnaire

FormEventMapping

```
- <items>
  - <arm>
    <number>1</number>
  - <event>
    <unique_event_name>initial_data_arm_1</unique_event_name>
    <form>prescreening_survey</form>
    <form>participant_info_survey</form>
  </event>
- <event>
  <unique_event_name>week_1_arm_1</unique_event_name>
  <form>participant_morale_questionnaire</form>
</event>
```

Metadata (Codebook)

```
- <records>
  - <item>
    <field_name>participant_id</field_name>
    <form_name>prescreening_survey</form_name>
    <section_header/>
    <field_type>text</field_type>
    <field_label>Participant ID</field_label>
    <select_choices_or_calculations/>
    <field_note/>
    <text_validation_type_or_show_slider_number/>
    <text_validation_min/>
    <text_validation_max/>
    <identifier/>
    <branching_logic/>
    <required_field/>
    <custom_alignment/>
    <question_number/>
    <matrix_group_name/>
  </item>
```

Events

```
- <events>
  - <item>
    <event_name>Initial Data</event_name>
    <arm_num>1</arm_num>
    <day_offset>0</day_offset>
    <offset_min>0</offset_min>
    <offset_max>0</offset_max>
    <unique_event_name>initial_data_arm_1</unique_event_name>
  </item>
- <item>
  <event_name>Week 1</event_name>
  <arm_num>1</arm_num>
  <day_offset>1</day_offset>
  <offset_min>0</offset_min>
  <offset_max>0</offset_max>
  <unique_event_name>week_1_arm_1</unique_event_name>
</item>
```

Example R code (from REDCap Documentation)

```
# Load needed libraries
# --> NOTE: RCurl is dependent on bitops
library(bitops)
library(RCurl)
library(Hmisc)
library(xtable)

# Set secret token specific to your REDCap
project
secret_token = 'YOUR_API_TOKEN'

# Set the url to the api (ex.
https://YOUR_REDCAP_INSTALLATION/api/)
api_url = 'YOUR_API_URL/'
```

```
curl_handle = getCurlHandle()
curlSetOpt(ssl.verifypeer = FALSE, curl =
curl_handle)
```

```
y <- postForm(api_url,
  token = secret_token,
  content = 'formEventMapping',
  format = 'csv',
  curl = curl_handle)
```

```
x <- read.table(file = textConnection(y),
  header = TRUE, sep = ",", na.strings = "",
  stringsAsFactors = FALSE)
rm(secret_token, y)
x
```

An R program uses the API to pull available data and metadata and writes a DDI 3.1 file.

REDCAP TO DDI

One Row, CSV File (Excel Template)

- Variable / Field Name
- Form Name
- Section Header
- Field Type
- Field Label
- Choices, Calculations, OR Slider Labels
- Field Note
- Text Validation Type OR Show Slider Number
- Text Validation Min
- Text Validation Max
- Identifier?
- Branching Logic (Show field only if...)
- Required Field?
- Custom Alignment
- Question Number (surveys only)
- Matrix Group Name

TASK

From:

One row per question
(with Header and Note)

To:

Hierarchical DDI
structure

Sliders

A SLIDER is a question type that allows the respondent to choose an answer along a continuum. The respondent's answer is saved as an integer between 0 (far left) and 100 (far right) with a step of 1.

You can provide labels above the slider

Middle label

Right-hand label



Click bar above and then drag to set response

- Return a value between 0 and 100
- End and mid points labeled
- Optionally display the numeric value
- How to represent?
 - Numeric
 - Categories for some values (0, 50 , 100)?
 - Recorded in the NumericDomain Description

Slider as Numeric question/variable

A SLIDER is a question type that allows the respondent to choose an answer along a continuum. The respondent's answer is saved as an integer between 0 (far left) and 100 (far right) with a step of 1.

You can provide
labels above the
slider

Middle label

Right-hand label



Click bar above and then drag to set response

```
</d:QuestionItem>
<d:QuestionItem id="97C40F2C-B7DA-4388-AC42-54CCB513D5A0" version="1.0.0">
  <d:QuestionItemName>slider</d:QuestionItemName>
  <d:QuestionText>
    <d:LiteralText>
      <d:Text>A SLIDER is a question type that allows the respondent to choose an
    </d:LiteralText>
  </d:QuestionText>
  <d:NumericDomain type="Integer">
    <r:NumberRange>
      <r:Low>0</r:Low>
      <r:High>100</r:High>
    </r:NumberRange>
    <r:Description>REDCap Field Type: slider . NOTE: This question has a min:
  </d:NumericDomain>
</d:QuestionItem>
```

This Description added to the NumericDomain

REDCap Field Type: slider .

NOTE: This question has a minimum of 0 and a maximum of 100.

The end and middle points were labeled as:

0, You can provide labels above the slider | 50, Middle label | 100, Right-hand label

Could be Slider as Coded variable

A SLIDER is a question type that allows the respondent to choose an answer along a continuum. The respondent's answer is saved as an integer between 0 (far left) and 100 (far right) with a step of 1.

You can provide labels above the slider

Middle label

Right-hand label



```
<d:QuestionItem id="55930335-0902-4739-9506-CAD738709E41" version="1.0.0">
  <d:QuestionItemName>slider</d:QuestionItemName>
  <d:QuestionText>
    <d:LiteralText>
      <d:Text>A SLIDER is a question type that allows the respondent to choose an answer
    </d:LiteralText>
  </d:QuestionText>
  <d:CodeDomain classificationLevel="Nominal">
    <r:CodeSchemeReference>
      <r:ID>757C6819-5850-4AE3-BACC-364790D08935</r:ID>
      <r:IdentifyingAgency>example.org</r:IdentifyingAgency>
      <r:Version>1.0.0</r:Version>
    </r:CodeSchemeReference>
    <r:Description>REDCap Field Type: slider . NOTE: The REDCap slider field returns
  </d:CodeDomain>
</d:QuestionItem>
```

This Description added to the CodeDomain

REDCap Field Type: slider .

NOTE: The REDCap slider field returns a numeric value between 0 and 100, but may have labels for the end and mid points.

CSV values for a conditional question

CSV Column Name	CSV value
Variable / Field Name	hidden_branch
Form Name	survey
Section Header	Section Header immediately before question hidden_branch
Field Type	text
Field Label	HIDDEN QUESTION: This question will only appear when you select the second option of the question immediately above.
Choices, Calculations, OR Slider Labels	
Field Note	A Field Note for a hidden question
Text Validation Type OR Show Slider Number	
Text Validation Min	undefined
Text Validation Max	undefined
Identifier?	
Branching Logic (Show field only if...)	[radio_branch] = "2"
Required Field?	
Custom Alignment	
Question Number (surveys only)	
Matrix Group Name	

The header and note will also be displayed conditionally

The Question and surrounding text will appear when this REDCap expression is true

Branching Logic (Show field only if...) **[radio_branch] = "2"**

hidden_branch,survey,"Section Header immediately before question hidden_branch ",text,"HIDDEN QUESTION: This question will only appear when you select the second option of the question immediately above.",,"A Field Note for a hidden question",,undefined,undefined,, "[radio_branch] = ""2""",,,

ControlConstruct chain to build the Instrument

CSV Column Name	CSV value
Variable / Field Name	hidden_branch
Form Name	survey
Section Header	Section Header immediately before question hidden_branch
Field Type	text
Field Label	HIDDEN QUESTION: This question will only appear when you select the second option of the question immediately above.
Choices, Calculations, OR Slider Labels	
Field Note	A Field Note for a hidden question
Text Validation Type OR Show Slider Number	
Text Validation Min	undefined
Text Validation Max	undefined
Identifier?	
Branching Logic (Show field only if...)	[radio_branch] = "2"
Required Field?	
Custom Alignment	
Question Number (surveys only)	
Matrix Group Name	

DDI d:StatementItem

DDI d:StatementItem

DDI d:QuestionConstruct

DDI d:Sequence

DDI d:IfThenElse

DDI d:Sequence
(master sequence)

DDI d:Instrument

```
<d:Instrument id="52B1FE0E-094F-437A-96AC-778CC7C3DD2E" version="1.0.0" age:
<d:InstrumentName>REDCap Questionnaire</d:InstrumentName>
<r:Software id="2234B4FA-D1EE-4BEE-A051-C05FF9897F91">
  <r:Name>REDCap Survey Questionnaire</r:Name>
  <r:Name>????</r:Name>
  <r:Name>REDCap Online Survey Questionnaire designer</r:Name>
</r:Software>
<d:ControlConstructReference>
  <r:Scheme>
    <r:ID>3ED16C54-7799-4597-9C23-82B73E6B30DD</r:ID>
    <r:IdentifyingAgency>example.org</r:IdentifyingAgency>
    <r:Version>1.0.0</r:Version>
  </r:Scheme>
  <r:ID>895C3AA6-5EBE-4B05-AACD-3E45DEA56060</r:ID>
  <r:IdentifyingAgency>example.org</r:IdentifyingAgency>
  <r:Version>1.0.0</r:Version>
</d:ControlConstructReference>
</d:Instrument>
```

More complex Instrument issues

- REDCap can set an option that ends the session upon entry of a particular value (a "stop action")
 - This could be represented with IfThenElse of a Sequence
 - Not done in this version
- REDCap has a Matrix Group construct
 - This is partly a layout issue but could be better documented with a sub-sequence than in this version of the program

Data

Some automatic variables

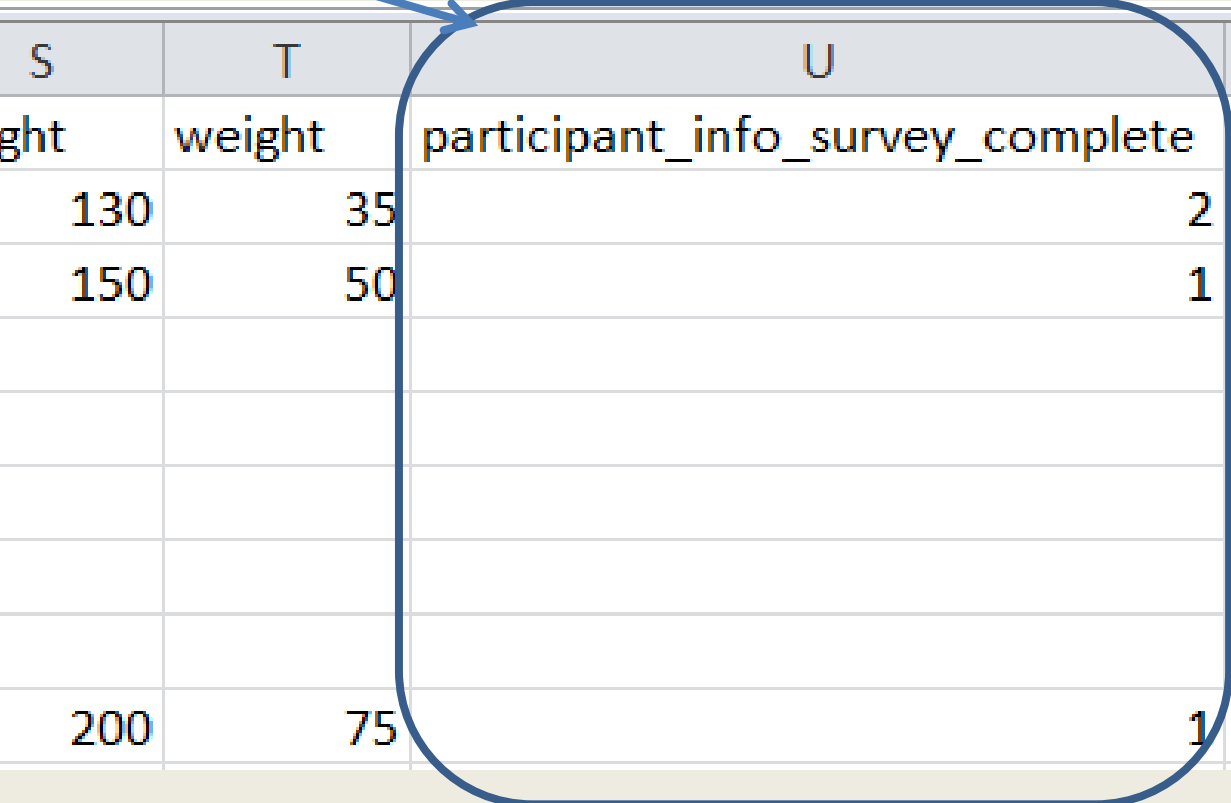


A	B	C	D	E	F
participant_id	redcap_event_name	dob	email	has_diabetes	consent__1
1	initial_data_arm_1	2/17/2013	none@example.org	0	1
2	initial_data_arm_1	2/27/2013	parti2@example.org	0	1
2	week_1_arm_1				
2	week_2_arm_1				
2	week_3_arm_1				
2	week_4_arm_1				
2	final_data_arm_1				
3	initial_data_arm_1	3/18/2013	foo@bar.com	1	0

One row per participant event

Data - Paradata

Some paradata



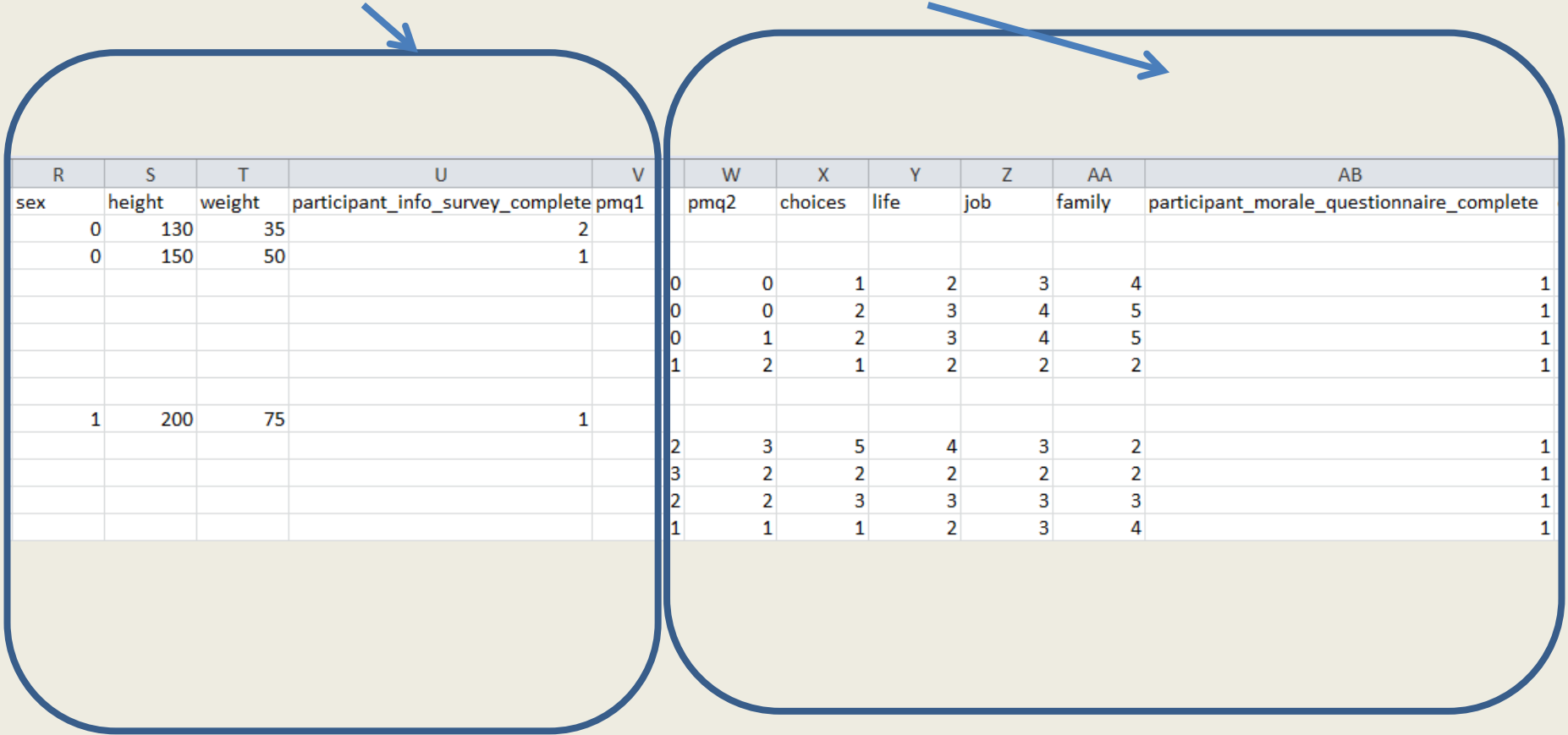
R	S	T	U	V
sex	height	weight	participant_info_survey_complete	pmq1
0	130	35	2	
0	150	50	1	
				0
				0
				0
				1
1	200	75	1	

"0, Incomplete | 1, Unverified | 2, Complete"

Data Multiple Forms

Data from form 1
participant_info_survey

Data from form 2
participant_morale_questionnaire



R	S	T	U	V
sex	height	weight	participant_info_survey_complete	pmq1
0	130	35		2
0	150	50		1
1	200	75		1

W	X	Y	Z	AA	AB
pmq2	choices	life	job	family	participant_morale_questionnaire_complete
0	0	1	2	3	4
0	0	2	3	4	5
0	1	2	3	4	5
1	2	1	2	2	2
2	3	5	4	3	2
3	2	2	2	2	2
2	2	3	3	3	3
1	1	1	2	3	4

Same variable in two forms has to have different name

Data Multiple Forms

Data from form 1
participant_info_survey

Data from form 2
participant_morale_questionnaire

R	S	T	U	V
sex	height	weight	participant_info_survey_complete	pmq1
0	130	35		2
0	150	50		1
1	200	75		1

W	X	Y	Z	AA	AB
pmq2	choices	life	job	family	participant_morale_questionnaire_complete
0	0	1	2	3	4
0	0	2	3	4	5
0	1	2	3	4	5
1	2	1	2	2	2
2	3	5	4	3	2
3	2	2	2	2	2
2	2	3	3	3	3
1	1	1	2	3	4

Multiple Instruments in DDI

R Function

```
REDCapAPI_ToDDI <- function(secret_token = "", # the token for the user&project
                             DDInstanceFile="", # the output DDI file
                             EchoDDI=FALSE, # if TRUE, print the generated DDI to the console
                             IncludeData=TRUE, # if TRUE, include PhysicalRecordSegment and output
                             StudyTitle="Study Title goes here", # the title of the study
                             agency="example.org", # the agency responsible for the data
                             organizationSchemeNameText="Org scheme", # the name for the
                                                                           # Organization Scheme
                             organizationNameText="Organization name", # the organization name
                             CurrentVersion="1.0.0", # the default current version number
                             EmbargoEndDateValue="2112-01-01T01:01:01" # a dateTime at which
the embargo on Personally Identifiable data will expire
)
```

Test – DDI to Colectica Express

Question Name

race

Question Text

Race

Response Options

Add Response Type

Coded Classification

Response Label	
Response Description	REDCap Field Type: dropdown
Selection Style	Select one Search for an item

CodeScheme7

Variable

Race

Agency example.org

Revision 1

Last Updated 2013-01-01

Representation

Details

Conceptual

Sources

External Metadata

Name

race

Label

Race

Description

This variable was collected from a REDCap dropdown menu.

Representation Type

Code

Coded Classification

Search for an item

CodeScheme7

☒ Blank values represent missing values.

0	American Indian/Alaska Native
1	Asian
2	Native Hawaiian or Other Pacific Islander
3	Black or African American
4	White
5	More Than One Race
6	Unknown / Not Reported

▼ Instruments

- Instrument for form prescreening_survey
- Instrument for form participant_info_survey
- Instrument for form participant_morale_questionnaire
- Instrument for form completion_data

Test – Data into SAS

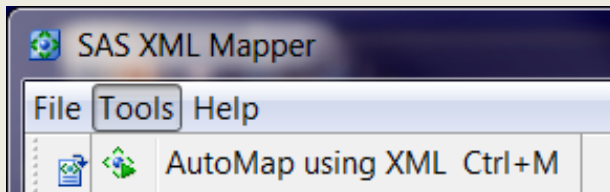


Table: Value Row: 1 / 468 Columns: 1 / 3 SAS formats and informats are not supported

	Record_ORDINAL	Value_ORDINAL	Value
1	1	1	1
2	1	2	initial_data_arm_1
3	1	3	2013-02-17
4	1	4	none@example.org
5	1	5	0
6	1	6	1
7	1	7	0
8	1	8	0
9	1	9	0
10	1	10	0
11	1	11	2
12	1	12	Ima
13	1	13	Testor
14	1	14	123 Main, Here, KS, 66666
15	1	15	(785) 555-1212
16	1	16	2

Going the other way – defining a REDCap survey by transforming a DDI 3.1 file to a REDCap csv template.

DDI TO REDCAP

Hierarchical DDI to one row per Question

- REDCap uses Code/Category schemes by repetition instead of by reference
- DDI Instruments may be much more complex than a simple sequence with a conditional display of a question.
 - Combining REDCap calculated fields with conditional display might allow Loop, RepeatUntil etc. function.
 - Parsing Instrument and ControlConstructs not done in this version.
 - E.g. no Section Headers or Field Notes

Hierarchical DDI to one row per Question

- URNs not evaluated
- Coded questions treated as "radio" fields.
- "checkbox" (multiple response)
 - multiple variables not generated
 - placed note in CodeDomain Description (not machine actionable)
 - treated as radio
- Calculated fields not generated
 - Could look for d:ComputationItem
 - Would require parsing arbitrary programming code and generating REDCap syntax

The metadata models for REDCap and DDI are not exactly the same.
Where do they not match up?

ISSUES

Issues

- Full DDI complexity not representable in REDCap
- REDCap co-mingles layout with content metadata
dropdown, radio, slider, - checkbox
- REDCap field type of “file” – file upload action
- REDCap export does not include project management features that it has (email triggers, scheduling. No perfect place for that in DDI?)
- DDI 3.1 doesn't handle numeric variables with some labeled values well (like slider fields)

Issues

- REDCap allows minimum and maximum for DateTime types
- DDI allows multiple low, high pairs for numeric variables – REDCap has just one pair
- REDCap can mark a Question as "required"
- REDCap can mark a Question as having personally identifiable information.
- REDCap – Some metadata only exportable through the API, some not at all

Issues

- DDI 3.1 has no Description for a QuestionItem, no good place to put notes about display options
- ResourcePackage vs. Studyunit
 - Where do Questions, Variables, Categories, Codes go?
 - Used ResourcePackage (more compatible with Colectica, which I used for validation)
- REDCap doesn't separate question and variable – same question in two different forms is two entities

REDCap Events Issues

- Does anything in DDI represents the scheduling of forms by events in a machine actionable way?
- The <Description> element in each <Instrument> may indicate the events for which the instrument is used

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Acknowledgements

Synthetic study data were collected and managed using REDCap electronic data capture tools hosted at The University of Kansas.¹ REDCap (Research Electronic Data Capture) is a secure, web-based application designed to support data capture for research studies, providing: 1) an intuitive interface for validated data entry; 2) audit trails for tracking data manipulation and export procedures; 3) automated export procedures for seamless data downloads to common statistical packages; and 4) procedures for importing data from external sources.

¹Paul A. Harris, Robert Taylor, Robert Thielke, Jonathon Payne, Nathaniel Gonzalez, Jose G. Conde, Research electronic data capture (REDCap) - A metadata-driven methodology and workflow process for providing translational research informatics support, J Biomed Inform. 2009 Apr;42(2):377-81.